APPENDIX G
SUMMARY OF JUSTIFICATION OF THE PROPOSED PROJECTS

EAST KENTUCKY POWER COOPERATIVE

Summary Of Justification Of The Proposed Projects Related to Providing A Connection To Warren RECC

Overview

On May 11, 2004, the East Kentucky Power Cooperative, Inc. ("EKPC") Board of Directors approved a resolution accepting an application from Warren RECC (WRECC) for membership with EKPC. WRECC currently is not connected to the EKPC power grid and EKPC initially investigated the possibility of wheeling of electric power from EKPC to WRECC through Tennessee Valley Authority's (TVA) system. This means that TVA would transfer electric power through its system from EKPC to WRECC for a fee. However, TVA would not agree to provide such a service and has taken the position that it will not provide transmission wheeling to their former electric power distributor WRECC. Therefore, EKPC determined that it must construct transmission lines that would tie WRECC into its system and transport electric power to WRECC's system.

A study was subsequently conducted to determine the transmission facilities that would be needed to reliably provide electric service to WRECC beginning in 2008. The design objective of this transmission study for service to WRECC was to develop an electric transmission system that would satisfy the following requirements:

- Provide a direct connection from the EKPC system to the Warren RECC system with sufficient capacity between the two systems to allow EKPC to contractually deliver the required power to meet Warren's peak demand.
- Connect all of Warren RECC's existing 161 kV delivery points (East Bowling Green/General Motors (GM), Memphis Junction, and Aberdeen)
  - ➢ It is important to note that transmission connections for the delivery of bulk power to WRECC are best made at the existing delivery points. Otherwise, extensive modifications and additions to the WRECC system would be required in addition to significantly more new paths for transmission.
- Connect the new Warren RECC 161 kV delivery point at Magna to the existing 161 kV delivery points.
- Provide an adequate and reliable transmission system that does not result in system problems for either EKPC or neighboring transmission systems for normal and/or single-contingency conditions.

EKPC investigated a number of electrical alternatives to the proposed project. The first alternative investigated was an extension at 69 kV from the Barren County Substation, EKPC's western most substation, closest to WRECC's system. However, this alternative was determined not to be feasible, because a 69kV system could not adequately (insufficient capacity) and economically serve WRECC's electrical demand, which is estimated to be approximately 400 megawatts in 2008.

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Since EKPC's Barren County Substation has existing 161 kV facilities, and 161kV facilities would provide enough capacity to serve WRECC's load, and since it is the closest EKPC substation to the Warren RECC system, the recommended plan is to build a 161 kV line from the Barren County Substation west to connect EKPC to the Warren system.

This new 161 kV line would connect the Barren County Substation to Warren RECC's easternmost delivery point at Magna. Then, in order to connect this project to the remainder of Warren RECC's delivery points, the following proposed projects were identified:

- Magna-GM – (already exists)
- GM-Memphis Junction
- Memphis Junction-Aberdeen

This plan provides a 161 kV backbone that stretches east to west from EKPC's system at Barren County to Warren RECC's westernmost 161 kV delivery point at Aberdeen, with intermediate connections to the other Warren RECC transmission delivery points.

While this plan provides a contractual path on paper from EKPC to Warren RECC, power flow analysis shows that it does not provide adequate and reliable service. Therefore, additional transmission support is required. The options evaluated for this support are as follows:

- Construct new 345 kV lines and facilities in the area.
  - Construction of 345 kV facilities was eliminated as an option for the following reasons:
    - ✓ The 161 kV line projects connecting EKPC's Barren County Substation to Warren's Magna, GM, Memphis Junction, and Aberdeen Substations would still be required.
    - ✓ At least 23 miles of 345 kV line would be required to connect the northern portion of the Warren RECC system (Leitchfield area) to the nearest 345 kV facilities (Hardin County, KY), which belong to LGEE.
      - ➢ This would also require construction of a new 345/161/69 kV substation facility in the Leitchfield area, and 345 kV substation in Hardin County.
    - ✓ An additional 29 miles of 161 kV line would then be required between the northern portion of the Warren RECC system and the central portion. This plan would cost twice as much as EKPC's proposed plan, and would encumber more new acres of rights-of-way.

- Maintain one or more of the existing 161 kV interconnections – East Bowling Green, Bristow, Memphis Junction, and Aberdeen -- between TVA and Warren RECC.
- Establish new interconnections with TVA in the area.

- Construct new 161 kV lines to the facilities of other utilities in the area. In addition to TVA, both Big Rivers Electric Corporation (BREC) and LG&E Energy (LGEE) have 161 kV facilities between Aberdeen and Wilson.
    - EKPC already has interconnections with LGEE and none with BREC. An interconnection with BREC provides a stronger connection for the Warren system than an LGEE connection, and the BREC connection would also allow EKPC and BREC to conduct energy transactions directly.

Therefore, the preferred plan was determined to be a plan that maintained some of the existing interconnections with TVA and also established a new interconnection with BREC at its Wilson Substation. The TVA interconnections that EKPC proposes to maintain as free-flowing interconnections are those at East Bowling Green and Memphis Junction. In addition, a new 161 kV interconnection with TVA at Salmons is desired.

The interconnection with BREC at Wilson establishes a desired connection between the BREC and EKPC systems and also allows elimination of the existing TVA interconnection at Aberdeen. The elimination of the existing interconnection at Aberdeen benefits TVA by providing them the opportunity to convert the Paradise-Bowling Green 161 kV line to 500kV if ever desired in the future. It also eliminates the need for TVA to maintain the Aberdeen 161 kV tap line off the Paradise-Bowling Green 161 kV line. TVA has indicated that there is significant maintenance cost associated with this tap line, due to the age and condition of the structures.

Therefore, the proposed plan is the optimal plan for the following reasons:

- It connects the EKPC system to the Warren RECC system with sufficient contractual capacity.
- It connects all of the Warren RECC 161 kV delivery points through a continuous 161 kV backbone.
- It maintains existing TVA connections to the Warren RECC system to minimize the amount of line construction required by EKPC.
- It provides sufficient support for EKPC's service to Warren, and it provides a parallel 161 kV system to TVA's existing 161 kV system in the area.
- It allows TVA to eliminate the existing connection at Aberdeen.
- It establishes a connection between the BREC and EKPC systems.

Justification of Delivery Points and Alternatives Considered

As mentioned above, one of the requirements of the EKPC transmission plan for service to Warren RECC is to connect Warren's 161 kV delivery points with a continuous 161 kV path. In past years, TVA offered for sale, and WRECC purchased portions of the local transmission delivery system at 69kV and 161kV. The WRECC system is configured for the delivery of wholesale power, and currently receives wholesale power from TVA, at three primary delivery points. These three delivery points are WRECC's existing East Bowling Green, Memphis Junction, and Aberdeen Substation.

Voltage levels at these locations are transformed from 161kV to 69kV. Because transmission connections must be made between the EKPC system and the WRECC system to provide service, these existing critical delivery points are the most reasonable connection locations for the proposed plan. If they were not used by EKPC, new delivery points requiring the construction of new substations to step down voltage and new transmission paths would be required. Because the WRECC system infrastructure already exists, the end points of the line construction are essentially **pre-determined**. To construct new delivery facilities, as compared to utilizing the existing ones, would be considerably more costly and would create unnecessary impact to the people and resources of the area.

East Bowling Green and GM are adjacent substations connected by a very short 161 kV line on the northeast side of Bowling Green. The Memphis Junction delivery point is on the southwest side of Bowling Green. Therefore, to provide a continuous path from the EKPC system to all of the Warren delivery points, a connection must be established between the East Bowling Green/GM and Memphis Junction Substations. The East Bowling Green/GM Substation would be linked to the Magna Substation to the east, and the Memphis Junction Substation would be linked to the Aberdeen Substation to the northwest.

No practical electrical alternatives to the GM-Memphis Junction line exist. A 161 kV link must be established between the eastern part of Warren's system and the western part. EKPC did consider a 161 kV line from GM to Aberdeen with a 161 kV tap line to Memphis Junction. However, the reliability of this system was determined to be unacceptable, since a single fault anywhere on this three-terminal line would eliminate EKPC's 161 kV connection to Memphis Junction. Therefore, it was determined that two independent 161 kV feeds to Memphis Junction are required to maintain one EKPC 161 kV feed to Memphis Junction during single contingencies.

Proposed Projects

EKPC has identified four (4) transmission line projects as part of its program to provide service to Warren RECC (See attached Warren Transmission Projects Map). These distinct projects are defined by the fixed endpoints dictated by the existing Warren RECC 161kV delivery points. Starting from the east and heading west, the connection must be made between EKPC's system at the Barren County Substation and WRECC's system at the Magna substation. This project is entitled Barren County-Oakland-Magna. The new construction portion of this project will extend to the Barren County Substation providing the connection to the EKPC transmission system. The project will proceed from west to east and will be done in consecutive steps to keep reliable service to the WRECC Oakland and Park City substations. Since the particular backfeed arrangement for the Park City substation is very sensitive to electric load levels, there is a restricted window for some of this work based on seasonal load levels.

Moving further east, the connection between the Magna substation and GM Substation already exists. Therefore the next project is the GM-Memphis Junction project that connects the East Bowling Green/GM Substations and the Memphis Junction Substation.

This project provides the needed backfeeds (voltage source from a secondary system) into East Bowling Green/GM and Memphis Junction Substations. Once constructed this line will allow continued, uninterrupted service to the residents of Bowling Green and the surrounding communities while other projects are constructed.

The next crucial project exists between the existing Memphis Junction Substation and Aberdeen substations. This project as proposed has been named Memphis Junction-Aberdeen. Construction of this line will provide a backfeed to the Aberdeen substation. Once this backfeed is established, proposed work on the Aberdeen substation can be completed. This line will also provide backfeeds into the West Bowling Green and Auburn substations. The West Bowling Green and Auburn substations are located on radial feeds, and the backfeeds into these systems are essential for reliability for those areas during construction.

Lastly, the connection between BREC's system and the EKPC system must be made between the Aberdeen Substation and the D.B. Wilson Power plant. This project has been entitled Wilson – Aberdeen. This will connect the Warren system into the D.B. Wilson Plant in Ohio County. This tie will complete the needed backfeed for transmission into the Warren system. As detailed above, construction of these four projects will provide the reliable electrical service through a 161kV backbone to the Warren System and provide a tie between the BREC and EKPC systems.

Issues Related To Timing of Construction Of The Warren Projects:

There are 4 projects that EKPC plans to construct to provide service to Warren RECC. The work will involve rebuilding of existing lines, paralleling existing lines, and/or construction on entirely new rights-of-way. The preferred order for construction of the proposed transmission line projects is as follows:

1st - GM – Memphis Junction
2nd - Memphis Junction – Aberdeen
3rd - Barren County – Oakland – Magna
4th - Wilson – Aberdeen

EKPC believes it is prudent to construct the GM – Memphis Junction project first for the following reasons:

1) Co-Location – EKPC's proposed alternative for this project would involve rebuilding approximately 8.56 miles or 56.28% of the proposed project. EKPC also proposes to parallel an additional 2.41 miles (~ 15.84%) of line. These rebuild and parallel sections generally require more time to construct than lines on new rights-of-way. Some of the rebuild sections for this project occur in heavily developed areas. Also, rebuilding existing facilities is typically more complicated to construct than construction of lines on new right-of-way for three primary reasons:
    - ✓ Teardown of existing facilities. The material that currently exists on site must be removed and properly disposed.

- ✓ Existing residences and structures. Frequently there are houses/buildings/outbuildings that have been built adjacent to the existing easement since the initial construction of the line.
- ✓ Threats to reliability are created when the existing facilities are taken out of service. The existing facilities are needed and when removed from service, WRECC must rely on backfeeds and procedures that are normally used for contingencies (unexpected problems in the system - fallen tree, transformer failure, etc). Because contingencies can still happen during the time of construction, the removal of the existing lines must be coordinated and their outage time minimized to avoid unacceptable levels of reliability.

2) Reliability – Construction of GM – Memphis Junction first provides the needed backfeeds (voltage source from a secondary system) into the East Bowling Green/GM and Memphis Junction Substations. Once constructed, this line will allow continued, uninterrupted service to the residents of Bowling Green and the surrounding communities while other projects are constructed.
3) Right-of-way acquisition – Far fewer new easements must be acquired for the section of the project that is being rebuilt. Typically the existing easement can be amended and restated to include the current project, and the process is less time consuming.

GM - Memphis Junction

	Length	Percent
Rebuild	8.56	56.28%
Parallel/Co-locate	2.41	15.84%
New Construction	4.24	27.88%
Total	15.21	100.00%

EKPC believes it would be prudent to construct the Memphis Junction – Aberdeen project as the second phase for the following reasons in addition to those cited in the discussion above:

1) The amount of line to be rebuilt is significant. A little over half (51.11%) of the proposed project would involve EKPC rebuilding existing facilities.

2) Construction of this line will provide a backfeed to the Aberdeen substation. Once this backfeed is established, proposed work on the Aberdeen substation can be completed. Again, in order to provide an appropriate level of system reliability, work on existing lines and terminal improvements must be carefully coordinated and sequenced.

3) Construction of this line will provide backfeeds into the West Bowling Green and Auburn substations. The West Bowling Green and Auburn substations are located on radial feeds, and the backfeeds into these systems are essential for reliability for those areas during construction.

Memphis Junction - Aberdeen

	Length	Percent
Rebuild	14.09	51.11%
Parallel/Co-locate	0.00	0.00%
New Construction	13.48	48.89%
Total	27.57	100.00%

It would be prudent to construct the Barren County – Oakland – Magna project as the third stage of line construction for the following reasons:

1) A significant percentage (nearly 59%) of the project will involve rebuilding existing (53.52%) facilities and paralleling (5.28%) existing lines. This line will be built in phases to provide continued reliability and prevent loss of service to existing customers in the area.
2) The project will proceed from west to east and will be done in consecutive steps to keep reliable service to the WRECC Oakland and Park City substations.
3) Since the particular backfeed arrangement for the Park City substation is very sensitive to electric load levels, there is a restricted window for some of this work based on seasonal load levels.
4) The new construction portion of this project will extend to the Barren County Substation providing the connection to the EKPC transmission system.

Barren County - Oakland - Magna

	Length	Percent
Rebuild	15.20	53.52%
Parallel/Co-locate	1.50	5.28%
New Construction	11.70	41.20%
Total	28.40	100.00%

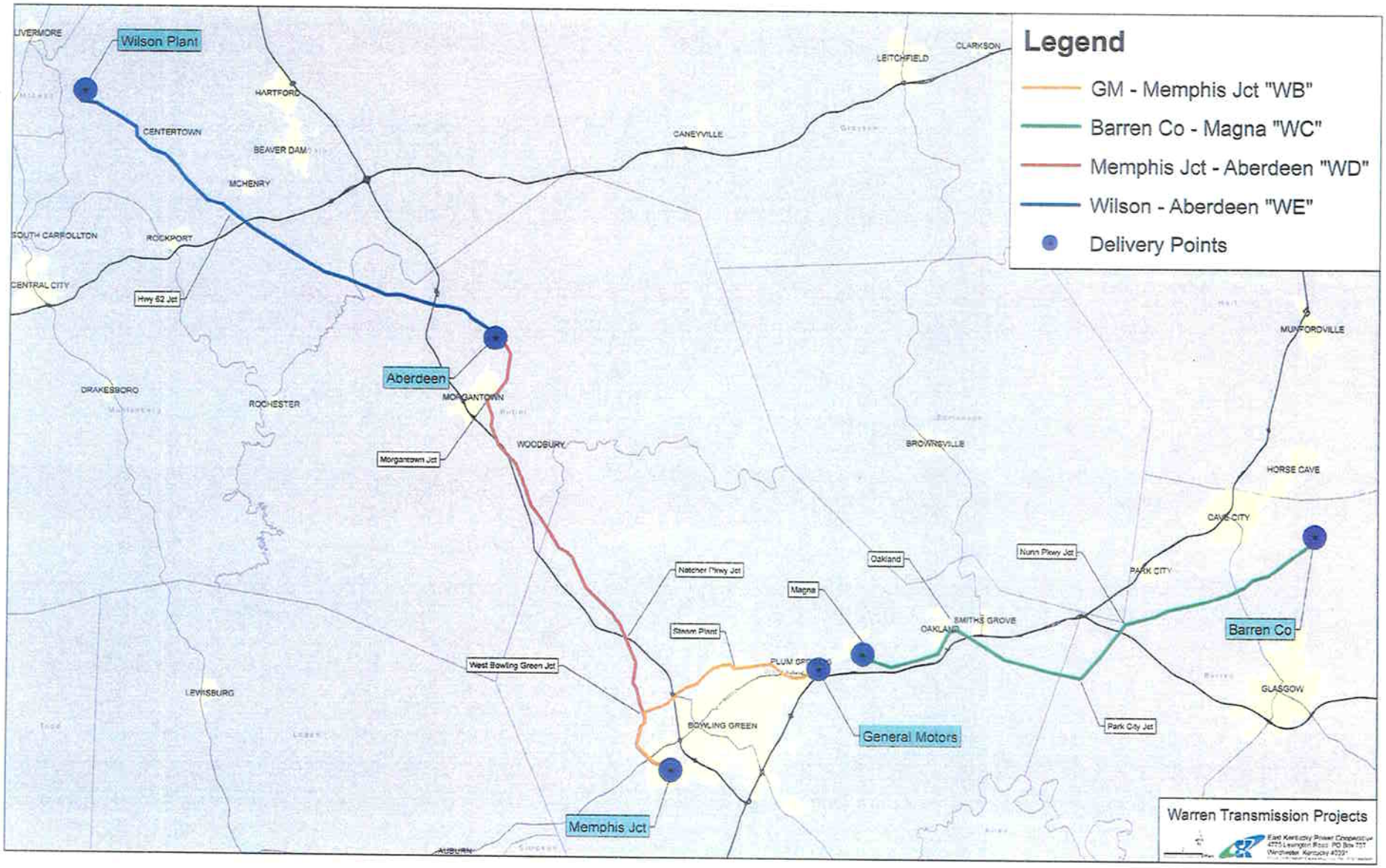
The Wilson – Aberdeen project is proposed to be constructed last. EKPC believes it would be prudent to construct this line last for the following reasons:

1) This line will be entirely new construction, therefore, easier to build without interruption or critical system coordination concerns. It will parallel an existing line for approximately four miles. Construction of this facility will not require removal of existing facilities. Therefore, it will not pose a threat to reliability in the area.
2) Since this is new construction, acquisition of easements for rights-of-way typically takes longer. Construction of this proposed project last would provide an opportunity to acquire the necessary and appropriate easements.

3) This will connect the Warren system into the D.B. Wilson Plant in Ohio County. This tie will complete the needed backfeed for transmission into the Warren system.

Wilson - Aberdeen

	Length	Percent
Rebuild	0.00	0.00%
Parallel/Co-locate	4.13	15.41%
New Construction	22.67	84.59%
Total	26.80	100.00%


Legend
GM - Memphis Jct "WB"
Barren Co - Magna "WC"
Memphis Jct - Aberdeen "WD"
Wilson - Aberdeen "WE"
Delivery Points
Wilson Plant
Aberdeen
Memphis Jct
General Motors
Barren Co
Hwy 62 Jct
Morgantown Jct
West Bowling Green Jct
Natcher Pkwy Jct
Steam Plant
Magna
Oakland
Nunn Pkwy Jct
Park City Jct
LIVERMORE
HARTFORD
CENTERTOWN
BEAVER DAM
MCHENRY
SOUTH CARROLLTON
ROCKPORT
CENTRAL CITY
DRAKESBORO
ROCHESTER
MORGANTOWN
WOODBURY
LEWISBURG
BOWLING GREEN
LEITCHFIELD
CLARKSON
CANEYVILLE
BROWNSVILLE
MUNFORDVILLE
HORSE CAVE
CAVE CITY
PARK CITY
SMITHS GROVE
OAKLAND
GLASGOW
Warren Transmission Projects